Muinín Catalyst STEAM Education for Sustainable Development and Futures Literacy

SDG 4 STEAM Tasters

Stand Alone Programme: STEAM Tasters

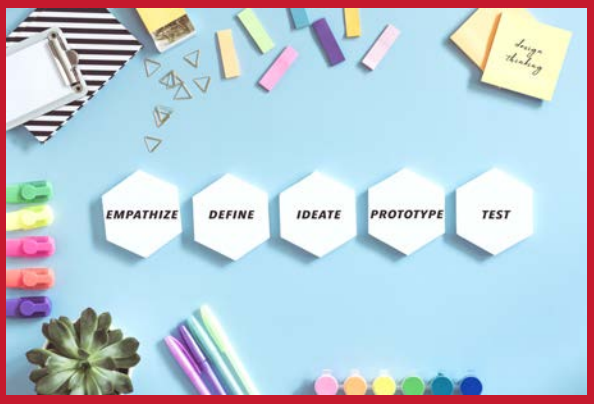
Subject Areas:
Science, Technology, Engineering, Arts, Mathematics, Humanities, Design

8 DECENT WORK AND ECONOMIC GROWTH
9 INDUSTRY, INNOVATION AND INFRASTRUCTURE
12 RESPONSIBLE CONSUMPTION AND PRODUCTION
17 PARTNERSHIPS FOR THE GOALS

SFI Discover Science Foundation Ireland

An Roinn Oideachais agus Scileanna
Department of Education and Skills

SDG4 STEAM Tasters



Introductory Micro-Module

Lessons 1 - 5

Subjects: Science, Technology, Engineering, Arts, Mathematics, Humanities, Design

Summary: STEAM Tasters

STEAM Tasters is an engaging and hands-on, five-lesson module designed to introduce learners to content and skills development in challenge-based design. The module aims to foster curiosity, creativity, and critical thinking skills among learners, providing a glimpse into the interdisciplinary nature of STEAM fields.

Design plays a crucial role in learning environments, influencing how information is presented, how engagement is fostered, and how concepts are absorbed.

The lesson activities are all underpinned by stages of Design Thinking, a problem-solving approach that emphasises empathy, creativity, and iterative prototyping to address complex challenges.

The module adapts lessons and activities from our Problem to Pitch core module and other leading innovation organisations. This module introduces learnings to disruptive innovation techniques and offers transferable skills.

In this toolkit, the learner will:

- be immersed in key skills of design
- demonstrate understanding through prototyping
- improve teamwork skills
- develop solutions to problems
- be encouraged to use critical thinking and creativity
- reflect and reconsider

Materials

- Lesson plans
- Worksheets

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Lesson 1: Design Challenge Stations
Design challenge stations offer participants a dynamic and interactive environment to tackle real-world problems, fostering creative thinking and collaboration. These stations provide a hands-on approach, encouraging participants to explore innovative solutions and refine their design skills within a constrained yet stimulating setting. In this lesson learners will be introduced to the process of Design Thinking by selecting one of three challenges without specific skill input.

Resources include: Design Challenge Briefs

Lesson 2: Rapid Prototyping- Improving Your Build
Rapid prototyping speeds up the design process by creating tangible models of a product, enabling designers to test and refine their ideas quickly. In this lesson learners will build upon their skills from the previous lesson, learning specific techniques for prototyping a design, in a new challenge.

Resources include: Worksheet: Rapid Response Prototyping

Lesson 3: Building Empathy
Empathy in design is vital as it allows designers to understand and connect with the needs, emotions, and experiences of the end-users. By putting themselves in the users' shoes, designers can create more inclusive, intuitive, and user-centric products or experiences. Empathy fosters a deeper understanding of diverse perspectives, resulting in designs that not only function effectively but also resonate on a human level, ultimately enhancing user satisfaction and engagement.
In this lesson learners will work with specific user profiles to design and prototype a chair.

Resources include: Worksheet: Stanford Design User Profiles

Lesson 4: Ready, Steady, Build!
Learners are set a challenge with deliberate limits that encourages creative thinking and problem solving, as well as enabling them to use the skills they have developed in previous lessons.

Lesson 5: Worst Idea Ever
The Worst Idea Ever is a technique used by innovation developers to ideate their way through bad ideas into good ones. In this lesson, learners will generate bad ideas for goods and services, transforming them into potential good ideas for market.

Module development and expertise: Dr Anita McKeown and Rebecca White, FutureFocus21c

If you wish to use these resources, we can offer an induction and online support throughout the unit. To register for this option, please contact e: hello@futurefocus21c.com

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Setting up an online learning environment for the lessons on this module:
Our lessons integrate the use of virtual learning environments. To ensure seamless use of our lessons, a module should be setup on your school's virtual learning environment such as Teams, Google Classroom, etc. Learners are encouraged to upload documents to share with their peers. If your virtual learning environment does not support document sharing, we recommend OneDrive or Google Drive.

You can also use Google Sites or Microsoft Sway to encourage learners to present their work over the year - this can easily be set up to reflect the aims of TY and provide a showcase for their work as well as assessment tool.

Setting up a Canva Education account:
If your virtual learning environment does not support document sharing, we recommend OneDrive or Google Drive.

As our lessons integrate design, our lessons also refer to Canva. Educators and schools are able to open a free Canva for Education account by registering. Canva for Education provides primary and secondary school teachers and students with premium features and templates. You can then also set up lessons and invite your learners to the class.

References

Bryan Mattimore Growth Engine Co- The Worst Idea Ever https://growth-engine.com/

Diana Simon Psihoterapeut Brené Brown on Empathy vs Sympathy https://youtu.be/KZBTYViDPlQ?si=mPnEwpA-ut0QWsP5 (Accessed 19.03.24)

dSchool, Stanford The 5 chairs challenge (2024) Available here: https://dschool.stanford.edu/resources/the-5-chair-challenge Accessed 24.03.24)

Cooper Hewitt Ready, Set, Design! https://youtu.be/jIXSuZg2awA?si=JqaarSh1nQjsYp7s (Accessed 19.03.24)

Crie UFRJ. The Power of Empathy https://youtu.be/747u3_Ms2tU?si=cDRXsZfj4LpSs8QA

Future Focus21c. STEAM Taster Programme with Transition Year Learners https://www.futurefocus21c.com/post/steam-taster-programme-with-transition-year-learners (Accessed February 2024).

Future Focus21c. Muinín Catalyst Sustainable STEAM as a pedagogical approach https://www.futurefocus21c.com/post/muin%C3%ADn-catalyst-sustainable-steam-as-a-pedagogical-approach (Accessed February 2024).

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Fanatical Futurist by 311 Institute Introduction to CRISPR Gene Editing Technology https://www.youtube.com/watch?v=1VaG3DpFXjs (Accessed 19.03.24)

Open Source Ecology Open Source Quaponic Greenhouse https://vimeo.com/141252002 (Accessed 19.03.24)

Megan Petersen. Paper Sculpture Techniques https://youtu.be/pi6Y7yCz7Y8?si=G5fPokDc4K_39eG6 (Accessed February 2024).

Nesta What is prototying? https://youtu.be/_1bOaNSy5XY?si=vxmCIlazOUu7DCJX (Accessed 19.03.24)

Science Gallery Colin Keogh and the Open Source Ventialor Project (Ireland) https://sciencegallery.org/stories/colin-keogh-and-the-open-source-ventilator-project (Accessed 19.03.24)

Spring2 Innovation. Design Thinking Step 1 Emphasize https://youtu.be/LSXop-NTfR0?si=KmMHd3_kKQBc7Ppe

Social Square What is open source as explained in LEGO https://youtu.be/a8fHgx9mE5U?si=21jFIhOZDkwMt8QC (Accessed 19.03.24)

Stanford The 5 Chairs Challenge https://dschool.stanford.edu/resources/the-5-chair-challenge

Stanford. Students practice prototyping at the Stanford d.School https://youtu.be/BGwakNDh8E4?si=_wyqssDio-H4kKMa

TED-Ed. Rapid prototyping Google Glass - Tom Chi https://youtu.be/d5_h1VuwD6g?si=CiVVPGVS2U36pLCW (Accessed February 2024).

The Rapid Foundation https://www.therapidfoundation.com/ (Accessed February 2024).

The Wall Street Journal The Open-Source Ventilator: How Doctors and Engineers are Solving the Shortage https://youtu.be/ZbzqM3BA8W8?si=X2Z2Eydgyj-coghe (Accessed 19.03.24

SDG4 STEAM Tasters

Lesson 1: Design Challenge Stations

Subjects: Science, Technology, Engineering, Arts, Mathematics, Humanities, Design

Lesson Title and Summary: Design Challenge Stations

Design challenge stations offer participants a dynamic and interactive environment to tackle real-world problems, fostering creative thinking and collaboration. These stations provide a hands-on approach, encouraging participants to explore innovative solutions and refine their design skills within a constrained yet stimulating setting. In this lesson learners will be introduced to the process of Design Thinking by selecting one of three challenges without specific skill input.

Vocabulary: Design, Iteration, Prototype, Test

In this lesson, the learner will:

- understand a challenge and develop a prototype to show a solution to it
- work as part of a team
- reflect on design choices and consider alternatives
- feedback on other teams, test their ideas, reflect on their design and improve it through iteration

Materials

- Design challenge briefs (see activity instructions)
- Craft materials (recyclable)
- Weight for testing designs (this should be roughly 1.5kg)
- Toy race car

SDG4 STEAM Tasters
L1: Design Challenge Stations

ACTIVITY INSTRUCTIONS

Activity 1: Forming groups and setting the brief (10 mins)

1. Ask learners to form groups of 2-3 people
2. Write out 3 design challenge briefs on the board

   a) Build a tower that is taller than 30cm and can hold a weight on top
   b) Build a bride across two tables that can support a toy card driving across it
   c) Build a boat that can float with a weight added to it
   In all challenges, the design cannot be affixed to a surface and teams can only use the materials provided.

3. Give groups time to decide which challenge they want to do. Let learners know that this challenge is designed to see what they can do with the materials provided, without learning any specific techniques.

Activity 2: Planning your build (5 mins)

1. Ask teams to look at the building materials provided (at this stage they cannot take anything) and make a plan for their design/challenge. They can make notes on paper, or sketch ideas. They can feel the weight provided that will be used in testing challenges a and c.

Activity 3: Building time (25 mins)

1. Teams have allocated time to build their design to meet the selected challenge.
2. Allow them to self-test their designs after 15 minutes has passed (i.e. check weight in boat or tower, drive car over bridge). This gives them time to self-correct any design errors before whole class testing.

Activity 4: Testing designs (10 mins)

1. Ask teams to finish their designs and bring to the front of the room for whole class testing.
2. Go through each design and test, using the weight or the car. Use on-the-spot reflection by asking questions such as:

- What worked well and why?
- What hasn't worked? Why do you think this?
- If you had more time, what would you change in your design?

REFLECTIVE EXERCISE: 3-2-1 (10 mins)

- Three things they feel they have learnt from the tasks.
- Two things they found most interesting and would like to explore more.
- One – their opinion they have about the tasks.

Use Post-its or a Mentimeter survey - Mentimeter.com - to gather reflections

SDG4 STEAM Tasters
L1: Design Challenge Stations

EXTENSION / REDUCTION ACTIVITIES:

Reduction: For a shorter lesson, pre-select one of the challenges to use with all teams and reduce timing on Activity 3.

Extension: For a longer lesson, increase timing on Activity 3 and include a written reflection task after Activity 4, using the same reflection questions. Encourage a discussion around how they could use the skills learned and practised in other subject areas.

MEDIA BOX: (materials, online video links, extra resources, case studies etc)

Video: Design Thinking [8:10 mins] https://youtu.be/WrdSkqRypsg?si=69Of49HwhDlMq4LK

Video: Reflecting on Learning in Design Thinking [2:33 mins] https://youtu.be/toowMhFRjH4?si=Th1dLIoSAgamBoEi

Website: The 5 Stages in the Design Thinking Process https://www.interaction-design.org/literature/article/5-stages-in-the-design-thinking-process Accessed 24.04.24

Blog: STEAM Taster Programme with Transition Year Learners https://www.futurefocus21c.com/post/steam-taster-programme-with-transition-year-learners

Blog: Muinín Catalyst Sustainable STEAM as a pedagogical approach https://www.futurefocus21c.com/post/muin%C3%ADn-catalyst-sustainable-steam-as-a-pedagogical-approach

LOCAL TRIP / EXPERTISE / ADDITIONAL WORK AND ASSESSMENTS

Invite the Design & Construction teacher to support the testing phase. They can provide advice for teams on reflection.
Organise a visit to UCD I-Form or UCD Innovation Academy to see prototyping in action
Look into industries where prototypes are necessary (i.e. architecture, engineering, product design)

SDG4 STEAM Tasters

Lesson 2: Rapid Prototyping- Improving Your Build

Subjects: Science, Technology, Engineering, Arts, Mathematics, Humanities, Design

Lesson Title and Summary: Rapid Prototyping- Improving Your Build

Learners will build upon their skills from the previous lesson, learning specific techniques for prototyping a design, in a new challenge.

Vocabulary: Design, Fastening, Joining, Prototype, Structuring

In this lesson, the learner will:

- skim and scan for specific information
- follow instructions
- demonstrate building techniques
- work as part of a team to design a prototype to solve a challenge
- reflect on design and consider alternatives

Materials

- Worksheet: Rapid Response Prototyping
- Card, scissors, glue, tape, tape, string, glue scissors, ruler
- Challenge newspaper- 8 sheets per group
- Hairdryer

SDG4 STEAM Tasters
L2: Rapid Prototyping- Improving Your Build

ACTIVITY INSTRUCTIONS

This lesson requires 80 minutes. Please divide into multiple lessons depending on your timetable.

Activity 1: Learning Structuring, Fastening and Joining (25 mins)

1. Explain to learners that they are going to further develop their prototyping build skills by completing a more detailed challenge. Ask them to form teams of 2-3 people. These can be the same teams from Lesson 1 or new ones.
2. Hand out Worksheet: Rapid Response Prototyping (this is best done digitally). Ask teams to work through the worksheet- reading, watching linked videos and making notes. This will prepare them for practicing building techniques.

Activity 2: Practising Structuring, Fastening and Joining (15 mins)

1. Now that the learners have an idea of the key techniques of Structuring, Fastening and Joining, they are going to have some time to practise them.
2. Distribute card, scissors, glue and tape to each team.
3. Give teams 15 minutes to practise the techniques they have been introduced to on Worksheet: Rapid Response Prototyping. Each team needs to present at least one example from each category- Structuring, Fastening and Joining. Monitor and provide assistance where necessary.

Activity 3: Using Structuring, Fastening and Joining in a challenge (25 mins)

1. Using the building techniques they have been practising, the teams are going to complete the following challenge: Build a tower that is a minimum of 30cm tall, that can withstand a hurricane. Each team will be provided with 8 sheets of newspaper, a pair of scissors and can select one extra material- glue, tape or string. Their tower cannot be affixed to a surface and must show examples of structuring, fastening and joining techniques. In this instance, the hurricane will be simulated by a hairdryer on full power.
2. Give teams 1-2 minutes to discuss ideas before receiving materials.

Activity 4: Testing designs (10 mins)

1. Test each design using the hairdryer.
2. Use on-the-spot reflection by asking questions such as:

- What worked well and why?
- What hasn't worked? Why do you think this?
- If you had more time, what would you change in your design?

SDG4 STEAM Tasters
L2: Rapid Prototyping- Improving Your Build

REFLECTIVE EXERCISE: 3-2-1 (10 mins)

- Three things they feel they have learnt from the tasks.
- Two things they found most interesting and would like to explore more.
- One – their opinion they have about the tasks.

Use Post-its or a mentimeter survey - www.mentimeter.com - to gather reflections

EXTENSION / REDUCTION ACTIVITIES:

Reduction: For a shorter lesson, complete Activity 1 & 2. Move Activity 3 & 4 to a following lesson.

Extension: For a longer lesson, extend the timing of Activity 2, 3 & 4. After testing, give each team another team's design and allocate time for them to improve the design. Re-test.

MEDIA BOX: (materials, online video links, extra resources, case studies etc)

Video: What is prototyping? [1:16 mins] https://youtu.be/_1bOaNSy5XY?si=vxmCIlazOUu7DCJX

Video: Rapid Prototyping | Google Glass | Tom Chi [8:08 mins]
https://youtu.be/d5_h1VuwD6g?si=CiVVPGVS2U36pLCW

Video: Paper Sculpture Techniques [5:17 mins]
[https://youtu.be/pi6Y7yCz7Y8?si=G5fPokDc4K_39eG6

Website: The Rapid Foundation https://www.therapidfoundation.com/

LOCAL TRIP / EXPERTISE / ADDITIONAL WORK AND ASSESSMENTS

Interview a local engineer on building towers.
Visit an Innovation Centre to see projects being worked on.

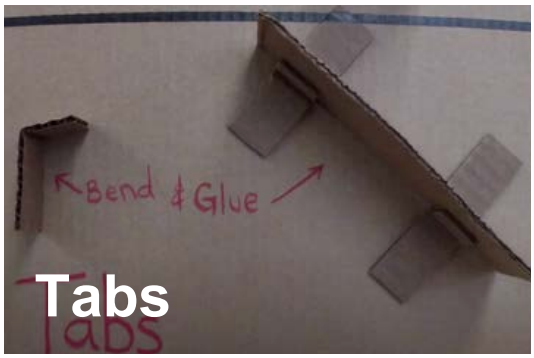
L2 WS RAPID RESPONSE PROTOTYPING

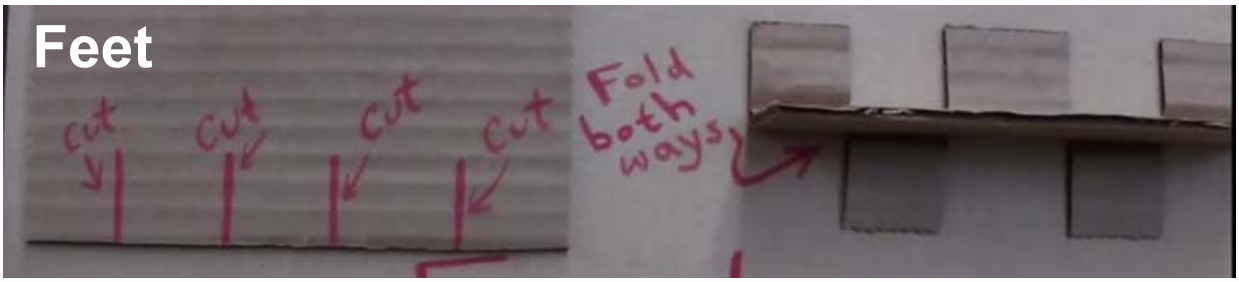
READY, STEADY, BUILD: KNOWLEDGE GATHERING

Today we are going to experiment with rapid prototyping with materials that we have at hand. You will explore three basic elements - useful for rapid prototyping:

- Structure
- Fastening / Joining
- Surface

1. Structure - this will provide support and form to your prototype. The structure provides strength by load-bearing if re-enforced or solid, e.g. columns or supports for covering or other materials, e.g. tent poles. Here's some simple tips for creating structure.





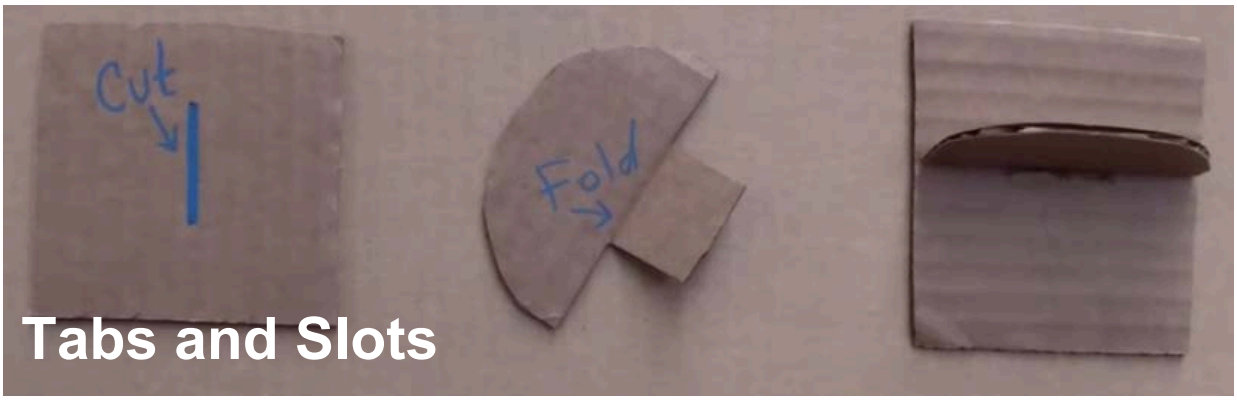
Watch the short video from Megan Peterson on structural techniques - all these processes can be scaled up to make bigger models and forms.

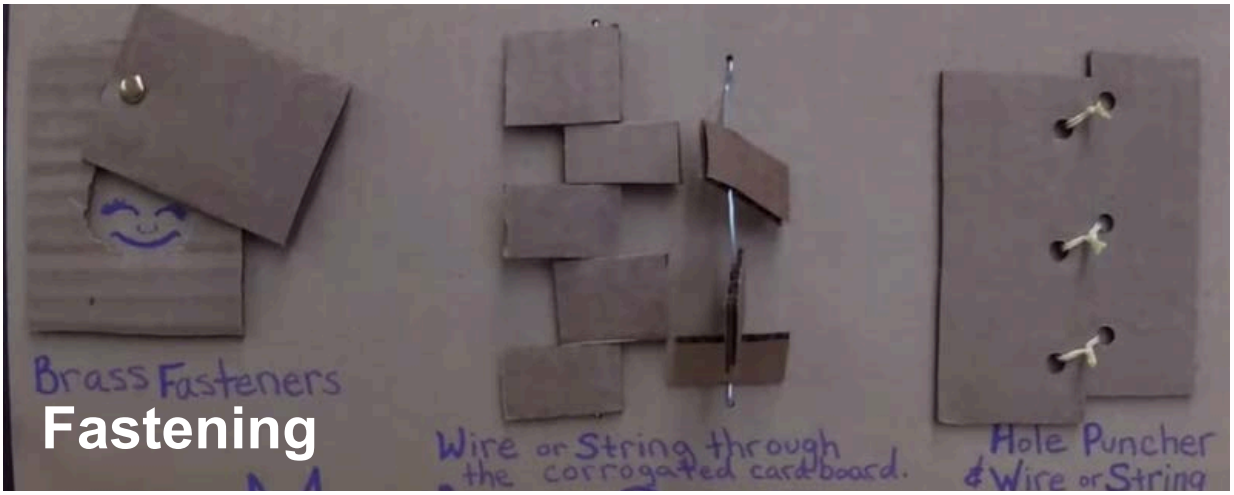
Write down the key ideas in the video. Use bullet points.

Creating 3D sculptures https://www.youtube.com/watch?v=pi6Y7yCz7Y8

L2: RAPID RESPONSE PROTOTYPING

2. Fastening / joining and attaching - this can be done using structural approaches such at slots and tabs or using other materials like pins, paperclips, string tape or glue.





Some techniques can be both structural and used to join things together like the slots / tabs - here on the left.

What other ways do you know of joining things together? Discuss this in your group and make a list.

Knots are another useful joining technique- here's a useful website for learning to tie knots https://www.animatedknots.com/complete-knot-list

SDG 4 STEAM Tasters

Lesson 3: Building Empathy

Subjects: Science, Technology, Engineering, Arts, Mathematics, Humanities, Design

Lesson Title and Summary: Building Empathy

Empathy in design is vital as it allows designers to understand and connect with the needs, emotions, and experiences of the end-users. By putting themselves in the users' shoes, designers can create more inclusive, intuitive, and user-centric products or experiences. Empathy fosters a deeper understanding of diverse perspectives, resulting in designs that not only function effectively but also resonate on a human level, ultimately enhancing user satisfaction and engagement.

Vocabulary: Design, Empathy, Needs, Perspective, User

In this lesson, the learner will:

- Read about a user and extract key information
- Begin to understand the importance of understanding a user's needs and limitations
- Design a product based on specific needs of a user
- Work as part of a team
- Be able to rationalise design choices
- Reflect on design and consider alternatives

Materials

- Worksheet: Stanford Design User Profiles
- Video: The Power of Empathy [2:53 mins]
- Poster paper and pens
- Making materials
  plasticine
  pop sticks
  card
  other recyclables (card, plastic, paper)

SDG 4 STEAM Tasters
L3: Building Empathy

ACTIVITY INSTRUCTIONS

his activity requires 80 minutes. Please divide into two lessons if your timetable requires it.

Activity 1: The Power of Empathy (10 mins)

1. Using Video: The Power of Empathy (see Media Box) ask learners to make notes using the following prompts. Discuss as a whole class.

- Empathy is different to Sympathy because...
- Empathy is...
- Empathy is important because...

2. Ask learners to share their ideas on why empathy might be important when we are designing for others.

Activity 2: Analysing user profiles (10 mins)

1. Ask learners to form teams of 2-3 people.
2. Using Worksheet: Stanford Design User Profiles and poster paper, make notes on the main ideas of each profile using the following prompts.

- What does the user do?
- What does the user like?
- What limitations does the user have?

3. Review each user as a whole class.

Activity 3: Developing a paper design (15 mins)

1. Each team needs to select one user from the worksheet to design a chair for.
2. Using notes, identify two needs (design principles) they see in the description of their user
3. Work on a paper design of a chair for the user- integrating the needs identified. Also consider what they do in their daily lives and what their likes are.
4. Monitor and support where necessary. Before moving onto building stage, each team's paper design needs to clearly demonstrate the features of their chair and the team is able to link that to the needs/likes/limitations of the user they have selected.

Activity 4: Developing a 3D prototype (20 mins)

1. Each team is going to use their paper design to build a 3D prototype of a chair using the making materials provided. The prototype needs to show the features of the chair and how it has included the user's needs and likes into the design.

Activity 5: Presenting prototypes (15 mins)

1. Each team has 1-2 minutes to present their prototype to the class and explain how it connects to the needs of their selected user. Allow one minute for other teams to give one piece of positive feedback and one idea for improvement.

SDG 4 STEAM Tasters
L3: Building Empathy

REFLECTIVE EXERCISE: 3-2-1 (10 mins)

- Three things they feel they have learnt from the tasks.
- Two things they found most interesting and would like to explore more.
- One – their opinion they have about the tasks.

Use Post-its or a mentimeter survey - www.mentimeter.com - to gather reflections

EXTENSION / REDUCTION ACTIVITIES:

Reduction: For a shorter lesson, complete Activity 1-3 and move Activity 4-5 into the next lesson.

Extension: For a longer lesson, extend timing on Activity 3-5. Activity 5 can be extended by asking teams to walk around and look at each design and add positive and constructive feedback to a piece of paper next to each design.

MEDIA BOX: (materials, online video links, extra resources, case studies etc)

Video: The Power of Empathy [2:53 mins] https://youtu.be/747u3_Ms2tU?si=cDRXsZfj4LpSs8QA

Video: Brené Brown on Empathy vs Sympathy [2:53 mins] https://youtu.be/KZBTYViDPIQ?si=6bABCDHMFrmvpjzs

Video: Design Thinking Step 1 Emphasize https://youtu.be/LSXop-NTfR0?si=KmMHd3_kKQBc7Ppe

Video: Students practice prototyping at the Stanford d.School https://youtu.be/BGwakNDh8E4?si=_wyqssDio-H4kKMa

Website: The 5 Chair Challenge https://dschool.stanford.edu/resources/the-5-chair-challenge

LOCAL TRIP / EXPERTISE / ADDITIONAL WORK AND ASSESSMENTS

Additional reflection:

- What was it like to build your chairs using the design principles you identified?
- Did you change anything along the way?
- Did anyone get stuck at any point? What happened and how did you get unstuck?
- Which material did you like best/least to work with? Why?

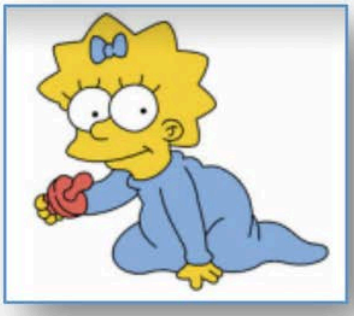
L3 WS STANFORD DESIGN USER PROFILES

The 5 chairs Design Thinking exercise

This exercise engages students with 5 users each with different needs. This forms the basis of the lesson.
Use these users to develop he design principles for the users chairs.

d. 5 Chairs users profiles – Stanford d.School

Grandad is an old man who is achy and sometimes a bit grouchy. He has trouble getting around, so he walks with a cane. He also has difficulty getting into and out of his chair, though he sits in his chair most of the day.



Maggie is a 1 year old who loves to play and crawl around everywhere. Maggie likes to explore on her own and be independent while she sucks on her dummy. When it's time for her to sit still she gets whiny and squirmy.

Ralph is at secondary school and spends 8 hours a day in class. Most of the time, Ralph has to sit in uncomfortable chairs, sitting up and facing the front of the room. When Ralph moves between classes, he carries a large backpack. When he gets to class he needs a place to put his stuff.

What do you notice about their needs?

Underline the important points of each of the user - the clues are in the descriptions.

L3: STANFORD DESIGN USER PROFILES

The 5 chairs Design Thinking exercise

Continue the exercise with the final two users.

Underline the important points of each of the user - the clues are in the descriptions.

Neil is an astronaut who travels to space. When he is in his space ship, he is in a weightless environment. This is cool most of the time, but it is a challenge when he needs to sit down and drink his Sprite. Neil also has a bulky space suit that often gets in the way.

Lisa is a marathon runner who runs every single day. She hates being stationary, and because she exercises so much she has really sore muscles. When she finally does sit down it's really important that her chair be very comfortable to help her relax and recover for her run the next day.

Empathy in Design

Empathy is the ability to put your self in someone else's shoes. It is important to use empathy within design otherwise our designs will not be useful. In a world with limited resources sustainable design must make sure that designs are not wasting valuable resources because they don't work and there was no engagement with the user.

SDG4 STEAM Tasters

Lesson 4: Ready, Steady, Build!

Subjects: Science, Technology, Engineering, Arts, Mathematics, Humanities, Design

Lesson Title and Summary: Ready, Steady, Build!

Learners will combine the skills they have practiced over the previous three lessons to compete in a final design challenge.

Vocabulary: Design, Empathy, Innovation, Prototype,

In this lesson, the learner will:

- reinforce skills of design
- apply skills of empathy to their peers
- work as part of a team
- follow challenge instructions and limitations
- work with specific materials to design
- reflect on design

Materials

- 1kg weight (e.g. dumbbell, food tins, rocks)
- Variety of recyclable materials for build
  - Cardboard
  - Plastic
  - Egg cartons
  - String
  - Paper
  - Plasticine
- Ruler/tape (to measure out 100metres)

- Additional worksheet: Ready Steady Devise

SDG4 STEAM Tasters
L4: Ready, Steady, Build!

ACTIVITY INSTRUCTIONS

Activity 1: Skills reminder and set the challenge (10 mins)

1. Go over the skills practised in previous taster sessions
- Fastening
- Joining
- Structure
- Surface
- Empathy

2. Ask learners for form groups of 2-3.
3. Set the challenge:
   Design a carrier that can hold a 1kg weight to be transported 100 metres and back again.
   Each component of the carrier must be made from a different material.
   You must clearly include a minimum of two techniques you have learnt.
   You must select one member of your team and design for their needs.

4. Allow learners to look at the materials they can work with, as well as the 1kg weight for testing. At this stage they can't take anything.
5. Walk out the 100m testing area.

Activity 2: Ready Steady Build: design (25 mins)

1. Allocate the first 10 minutes to paper design and discussion only. Considering the team member they will design for, the materials they will use, and the techniques they will include.
2. Move to design time. Remind learners that it is a quick-and-dirty build.

Activity 3: Ready Steady Build: testing (15 mins)

1. As a whole class, test each carrier. You may decide to allow each team to test their own carriers, or swap carriers amongst the teams for testing. Use on-the-spot reflection to share positives aspects of each design and areas for improvement.

REFLECTIVE EXERCISE: 3-2-1 (10 mins)

- Three things they feel they have learnt from the tasks.
- Two things they found most interesting and would like to explore more.
- One – their opinion they have about the tasks.

Use Post-its or a Mentimeter survey - mentimeter.com - to gather reflections

SDG4 STEAM Tasters
L4: Ready, Steady, Build!

EXTENSION / REDUCTION ACTIVITIES:

Reduction: For a shorter lesson, divide into two lessons. Complete Activity 1 and paper designs in the first lesson, and the build and Activity 3 in the following lesson.

Extension: For a longer lesson, allow a second design phase for teams to improve their carriers. You can also increase the weight to see how designs respond. Ask learners to reflect in writing on their design: What worked well and why? What needs improvement and why? How close to the paper design was the carrier?

For an additional lesson watch the video 'Ready Set Design' you can use the additional worksheet for a 'Ready Steady Devise' activity linked to the SDGs

MEDIA BOX: (materials, online video links, extra resources, case studies etc)

Video: Paper Sculpture Techniques [5:17 mins]
https://youtu.be/pi6Y7yCz7Y8?si=NFrsTxNr8XPZJG89

Video: Ready, Set, Design! [3:26 mins] https://youtu.be/jIXSuZg2awA?si=JqaarSh1nQjsYp7s

LOCAL TRIP / EXPERTISE / ADDITIONAL WORK AND ASSESSMENTS

Organise research, innovation and industry trips to explore their processes and departments in action. For example:

- Liebherr
- Tom Crean Centre
- Rediscovery Centre
- RDI Hub, Killorglin
- iForm

Learners could organise an event in school or the local community for April 21st, the UNs World Creativity Innovation Day that focuses on creativity, innovation and in problem-solving.

L4: READY SET DEVISE

Ready Set Devise - is a fun online version of Ready Set Design, an introduction to Design Thinking and related skills - teamwork, innovation, and creativity. As a strategy, it can be used in multiple classes using a range of variables or materials when working in person.

1. Ready - Share out challenge cards - these are open-ended questions that set the learners their design challenge - depending on the age or the purpose you can scale the complexity of the challenge

> The Challenge:
>
> Using the variables selected devise a lesson plan to kick start a project
>
> You have 5 minutes to select your variables and 15 minutes to devise.

2. Set - select one of each of the variables below, which will form the basis of your activity - SDG target, Driving Question and Subject integration - for a chosen age group.

3. Devise - you have 20 minutes to devise a solution.

EXPLORE AN SDG	12 RESPONSIBLE CONSUMPTION AND PRODUCTION	13 CLIMATE ACTION	11 SUSTAINABLE CITIES AND COMMUNITIES
INTEGRATE SUBJECTS	Science - use any of the sciences Art - create the visuals for a social media campaign	Engineering Maths Art - Build a model - real or virtual	Technology Maths Art - Create a web page
DRIVING QUESTION	How can we create a movement for healthy, affordable, sustainable food in our community?	How can our school become a carbon-neutral facility?	How do we reduce the negative impact of plastics in our freshwater and oceans?

SDG4 STEAM Tasters

Lesson 5: Worst Idea Ever

Subjects: Science, Technology, Engineering, Arts, Mathematics, Humanities, Design

Lesson Title and Summary: Worst Idea Ever

What makes an idea good or bad?

This lesson enables students to develop an understanding of the importance of developing ideas and looking for opportunities to iterate and improve on existing ideas.

In this lesson, learners will be introduced to Bryan Mattimore's 'worst idea ever' concept in order to develop ideation and reflective skills around product ideas.

Vocabulary: Design, Idea, Iteration, Remix

In this lesson, the learner will:

- explore how to evolve ideas
- consider opportunities to improve ideas
- feel comfortable with exploring experimental approaches
- develop skills around idea generation
- learn to transfer and apply skills

Materials

- A3 paper
- Markers

SDG4 STEAM Tasters
L5: Worst Idea Ever

ACTIVITY INSTRUCTIONS

Activity 1: Worst Idea ever – Rapid Response (15 mins)

1. Learners will work in groups of 2-3 to come up with examples (aim for 5-7) of the worst ideas ever. See Teacher's Notes for examples to model.
2. Give groups five minutes to come up with their examples.
3. Share ideas as a whole group.

Activity 2 Transforming Ideas – Rapid Response (15 mins)

1. Select one of the examples that was given and show how it could be transformed into a good idea. Ask for some other examples to be modelled by learners.
2. Swap example lists around so that each group has another group's list.
3. Ask learners to transform as many of the examples into good ideas as possible in 10 minutes.

Activity 3 Generating and Remixing Ideas – Rapid Response (20 mins)

1. Ask each group to share 1-2 of the ideas that they transformed. Write on the board.
2. Discuss:

- What was more difficult- thinking of bad ideas or transforming them into good ones?
- Which of the ideas listed on the board are actual good ideas? What makes them good?
- How does this type of activity help businesses to develop products, services and ideas?

REFLECTIVE EXERCISE: 3-2-1 (10 mins)

- Three things they feel they have learnt from the tasks.
- Two things they found most interesting and would like to explore more.
- One – their opinion they have about the tasks.

Use Post-its or a Mentimeter survey - Mentimeter.com - to gather reflections

SDG4 STEAM Tasters
L5: Worst Idea Ever

EXTENSION / REDUCTION ACTIVITIES:

Reduction: For a shorter lesson, complete Activity 1 & 2 and move Activity 3 to the following lesson, or set as a digital at-home writing task.

Extension: For a longer lesson, increase timing on Activity 2 & 3. Introduce key ideas of open source by watching Video: What is open source as explained in LEGO (see Media Box). Discuss the benefits of open source for idea generation and development.

MEDIA BOX: (materials, online video links, extra resources, case studies etc)

Video: What is open source as explained in LEGO [4:40 mins]
https://youtu.be/a8fHgx9mE5U?si=21jFIhOZDkwMt8QC

Video: Open source ventilator [5:15 mins] https://youtu.be/ZbzqM3BA8W8?si=X2Z2Eydgyj-coghe

Video: Introduction to CRISPR Gene Editing Technology [4:22 mins]
https://www.youtube.com/watch?v=1VaG3DpFXjs

Video: Open Source Quaponic Greenhouse [3:44 mins] https://vimeo.com/141252002

Website: The Rapid Foundation https://www.therapidfoundation.com/

Website: Colin Keogh and the Open Source Ventialor Project (Ireland)
https://sciencegallery.org/stories/colin-keogh-and-the-open-source-ventilator-project

Bryan Mattimore and Growth Engine https://growth-engine.com/people/

LOCAL TRIP / EXPERTISE / ADDITIONAL WORK AND ASSESSMENTS

Share some examples of open source projects for learners to research – see media box

- Open Source Ventilator
- Crispr Editing
- Aquaponic Greenhouse

Invite an innovator to talk about ideas generation (e.g. Dr Colin Keogh from The Rapid Foundation

L5: TEACHERS' GUIDE WORST IDEA EVER

The session is an iteration of the 'Worst Possible Idea' a term coined by author, president and co-founder, Bryan Mattimore, The Growth Engine Company LLC.

As a facilitation tool for ideation, the 'Worst Possible Idea' (WPI) turns the process of developing ideas upside down. Rather than having the pressure of coming up with new or innovative ideas, the activity facilitates agile creative thinking in a relaxed, fun, collaborative atmosphere. The process is used by professionals, design studios, within hackathons and start-up weekends, and has been shown to boost confidence, challenge assumptions and offers a more inclusive approach to ideation.

To start, here are some 'bad' ideas you can model:

- a sealed metal tube for a boat / as transport
- a chocolate teapot
- windows you can't see out of

How could these be transformed into good ideas?

- a sealed metal tube for a boat / as transport = add an engine / design and pressurise it
- (submarine), add windows and wings (aeroplane), different wheels and slick design (bullet train)
- a chocolate teapot= why is it a bad idea? It would melt. However, the 'hot chocolate spoon' that retails for about €4-5 uses that quality as a design feature to create a gift / treat product
- windows you can't see out of = this how 'bathroom' or privacy glass started